5 THE ROLE OF ADAPTABILITY

5.1 WHAT ARE THE TENDENCIES IN DEMAND? THE APPRECIATION OF NON-COGNITIVE SKILLS[1]

KÁROLY FAZEKAS

Nobel-laureate economist James Heckman gave a definite answer in a presentation held in 2016 to the question of how education policy can provide solutions to eliminating the increasing gap between the skills needed by the economy undergoing revolutionary transformation and the supply of labour. "We can reduce inequality, foster inclusion, and promote social mobility by solving the skills problem. ... Invest in prevention, not remediation. Invest in flourishing lives, not in correcting problems after they appear." (*Heckman,* 2016.)

Heckman's suggestion must be interpreted in the *lifecycle investment framework*, adopted by him and his colleagues, which is related to the literature of human capital investment. The main principle behind this theory is that the earlier the stage of life is in which we invest in people's skills, the higher the individual and social rate of return will be. According to the economic approach it does matter when, how and for what skills the limited resources are spent on in order to enhance society's welfare.

Countries achieving outstanding success in economic development in the past few decades were the ones that efficiently developed the cognitive skills of participants of education and training systems. This link is clearly demonstrated by analyses linking the national averages of tests measuring the cognitive skills of pupils with data on the economic growth of individual countries. Collating the PISA scores of 50 countries between 1960 and 2000 with their GDP growth rates, *Hanushek–Woessmann* (2012) revealed that there is a strong and significant relationship between the rate of long-term growth and the tendencies in the test scores.

The cognitive skills of pupils also have a substantial impact on their later life: there is a close relationship between the level of cognitive skills and a later probability of unemployment, social deviances as well as health, life expectancy and expected income (*Burks et al,* 2009). These findings are also supported by the growing recognition of educational attainment and the markedly increasing returns on more advanced qualifications. This phenomenon is placed in a broader context by the literature on skill biased technological change, which explains why demand for labour and relative wage returns decrease among low-qualified and low-skilled workers.

However, something has changed in recent years. Not least because of the information technology revolution going on in the world, there have been significant changes in wage returns and in the probability of unemployment in the developed economies. The graphs comparing educational attainment lev-

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els and the expected wage and probability of unemployment, until now showing a positive linear relationship, now increasingly show a U curve. While the position of higher education graduates has significantly improved and that of the low qualified has slightly improved, the relative labour market position of those with mid-level qualifications has been deteriorating continuously. This tendency reflects developments in the sectoral and occupational structure of the economy: the increase both in professions requiring more advanced qualifications and cognitive skills and in low-skill occupations of the expanding service sector (*Autor,* 2011; *Autor–Dorn,* 2013; *Adecco Group,* 2017).

At the same time, analyses indicate that the changing *task content of occupations* plays a more important role in this process than changes in the occupational structure. Considering the changes in the content of tasks, there is a new development in the labour market of developed countries, which has not previously been fully explored: *the growing share and importance of tasks requiring non-cognitive skills* (*Whitmore et al,* 2016). This was first pointed out by the widely cited study of *Autor et al* (2003). In the period they examined (1960–2000), the share of tasks requiring non-routine cognitive and social skills continuously increased in the labour market of the United States, while the share of (routine and non-routine) manual tasks and the share of those requiring routine cognitive skills declined.

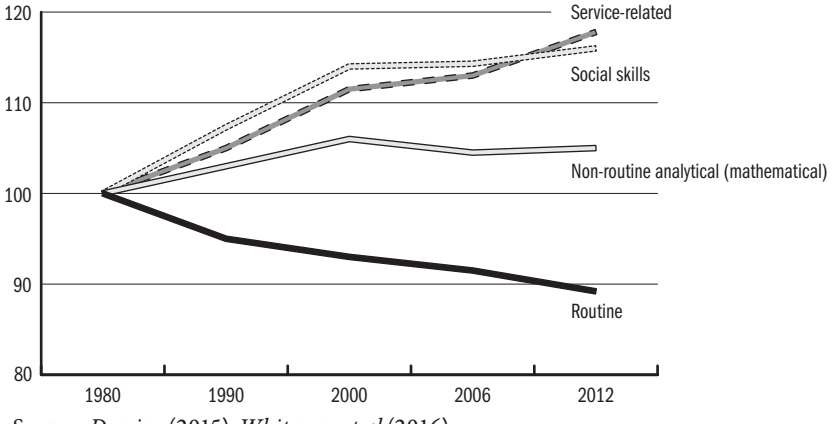
Technological development has continued to reduce the proportion of routine tasks in developed economies over the last decades because of their automation. At the same time, the share of tasks based on social skills and cooperation skills grew steadily. The increase in the share of tasks requiring cognitive Science, Technology, Engineering and Mathematics, (STEM) skills is hardly surprising. Numerous papers discuss the assessment of this process, the state-of-the-art teaching of STEM skills as well as the short- and long-term effects of developing STEM skills (for more details, see Subchapter 4.2 of *In Focus*). The U shape curve presented in *Autor et al* (2003) well demonstrates the increasing significance of advanced STEM skills and cognitive skills in general in the labour market.

Based on the updated data of *Autor–Price* (2013) and *Autor et al* (2003), *Deming* (2015) provided a more detailed insight into the nature of the polarisation of job tasks in the period 1980–2012. It highlighted an important and recently especially growing, new trend. On the one hand, the share of relatively easily automated, routine cognitive tasks *continuously decreases*. On the other hand, the share of tasks requiring cognitive STEM skills increases at first but then *stagnates* and the share of tasks requiring non-cognitive, soft skills and of tasks related to services *steadily increases*.

Deming explains that the obvious polarisation of the labour market is because while routine tasks are increasingly automated, tasks requiring cooperation, interpersonal, soft, non-cognitive skills and emotional intelligence are

– to date – not affected by the expanding use of robotisation and artificial intelligence in developed countries. However, the expansion of service sector related tasks does not result solely from technological development. It is reinforced by sweeping urbanisation as well as the dramatic increase in healthcare, nursing and tasks relating to care of the elderly resulting from demographic tendencies, especially the aging of societies (*Brunello–Schlotter*, 2011).

Figure 5.1.1: Changes in the nature of job tasks in the United States, 1980–2012



Source: *Deming* (2015), *Whitmore et al* (2016).

The importance of non-cognitive skills

The integration of the impacts of non-cognitive skills supporting cooperation and business efficiency in economic thinking and especially their quantitative analysis present considerable difficulties. Economics strives towards including researched phenomena in a coherent theoretic framework. Economic research has to fulfil the requirement that the concepts integrated in the framework are well-defined, with a meaning clear and unambiguous for everybody. While in the case of cognitive skills, the concepts describing the skills are unambiguous and the skills are measurable with standard methods, thus the results are possible to incorporate in a theoretic framework and the impacts of the variables may be modelled and tested, the economic analysis of the impact of non-cognitive skills is far more challenging (*Scorza et al,* 2015).

Non-cognitive skills are traditionally researched by psychology, especially personality psychology. This scientific discipline has achieved major results in defining and researching personality traits. Economic research primarily relied on the findings of personality psychology research to identify the concepts describing non-cognitive skills which were integrated in theoretical models analysing the role of human capital (*Heckman,* 2012). Nevertheless, the integration was challenging, since there was no consensus regarding

the precise definition of personality traits and about measuring their qualities and very few studies measured personality traits or explored their causal relationship with life events.

The majority of studies on non-cognitive skills in demand in the labour market contain lists of personality traits deemed important for their labour market relevance on the basis of general observation or specific experience relevant to an area at best – for example interviews conducted with business executives. These lists are compiled according to the priorities of their compilers and include overlapping terms and synonyms, which are difficult to distinguish. Understandably, researchers tried to create groups that describe personality traits with different labour market impacts and individual social consequences from a specific aspect or differentiate between them.

The Big Five model, widely used in personality psychology and relatively widely accepted in economic analysis, organises the non-cognitive skills into five groups: extraversion, agreeableness, conscientiousness, emotional stability and openness. This grouping is essentially the result of semantic statistical analysis of English language texts but several studies confirm that these skills are universal and the same five groups of skills may be distinguished in other languages and cultures. *Table 5.1.1* lists the content of the groups of skills and the notions most related to each group of skills. The advantage of this model is that there is consensus among researchers about the meaning of the groups of skills, there are more or less standardised methods for measuring their quality and the findings of assessments may be integrated in economic models.

Table 5.1.1: Non-cognitive skills belonging to the Big Five groups of skills

Conscientiousness	Agreeableness	Emotional stability	Openness	Extraversion
Dependability	Collaboration	Confidence	Creativity	Assertiveness
Grit	Collegiality	Coping with stress	Curiosity	Cheerfulness
Organisation	Generosity	Moderation	Global awareness	Communication
Persistence	Honesty	Resilience	Growth mindset	Friendliness
Planning	Integrity	Self-consciousness	Imagination	Leadership
Punctuality	Kindness	Self-esteem	Innovation	Liveliness
Responsibility	Trustworthiness	Self-regulation	Tolerance	Sociability

Source: *Roberts et al* (2015) p. 10.

The relationship between economics and personality psychology nonetheless is not unidirectional. Economics, while utilising the definitions and test results used for measuring skills, also contributes to clarifying the content of concepts, standardising assessment procedures and exploring causalities. Several papers draw attention to the importance of interdisciplinary dialogue and joint research programmes with the involvement of economists, psychologists, behaviourists, brain scientists, education researchers and researchers

from other disciplines. Heckman himself also calls attention to the influential results of anthropological research conducted in this field (*Stasz,* 2001; *Heckman et al,* 2014).

The labour market impacts of personality traits have recently been investigated by several studies. Findings tend to indicate that non-cognitive skills influence success in the labour market at least as strongly as cognitive skills (*Carneiro et al,* 2007). However, several studies highlight the methodological difficulties and weaknesses of these kinds of analyses. They often examine the labour market impact of only one non-cognitive skill and ignore the interactions between individual skills as well as the reciprocal influence of cognitive and non-cognitive skills. In this respect, recent research applying new data analysis methods and statistical procedures, e.g. machine learning, in order to create a nomenclature with better explanatory power (*Mareckova–Pohlmeier,* 2017) is truly remarkable. Relying on these methods, and on sufficiently large meta-databases, it is possible to identify the most relevant skills in terms of impact on the labour market (one should not only examine the impact of skills deemed important according to one's own priorities).

The economic research of James J. Heckman and his colleagues on the role of non-cognitive skills – mostly conducted in the *Center for the Economics of Human Development* of the University of Chicago – is widely known. Findings concerning the returns on investment in skills development are of utmost importance. This research is closely linked to research into the neurological basis of cognitive processes (*Heckman,* 2007a, b) and rely on the results of long-term, longitudinal studies on the individual and social impact of non-cognitive skills (*Knudsen et al*, 2006). These analyses highlighted the decisive role of parenting and family background as well as the significance of early childhood education and care in lifelong learning. Furthermore, they confirmed that the development of non-cognitive skills in childhood and early childhood have far-reaching consequences on the entire economy and society. The non-cognitive skills observed in childhood have an impact, among others, on the educational attainment observed in adulthood, on the incidence of teenage pregnancy and the probability of smoking and delinquency (*Borghans et al,* 2008; *Bowles et al,* 2001; *Knudsen et al,* 2006).

The econometric models related to the theoretical framework developed and continuously refined by Heckman and his colleagues revealed the impact of several (seemingly unrelated) variables (weight at birth, height, nutrition, mental disorders) on the quality of life of young generations. *Heckman–Kautz* (2012) also emphasise the need for interdisciplinary dialogue in the analysis of the impacts of non-cognitive skills, and that economics contributes to it by precisely defining different skills, developing the various assessment methods of different skills and revealing the social and economic impacts of the qualities of these skills.

Why has the importance of non-cognitive skills been increasing in recent years?

Non-cognitive skills have not only been given priority in forecasts for the future but also in evaluating current situations. Several complaints from corporate management in recent years called attention, in addition to the well-known cognitive skill gap, to the growing difficulties in finding employees fulfilling the requirements for non-cognitive skills (*Casner-Lotto–Barrington,* 2006). The increasing demand for well-developed non-cognitive skills is also reflected in the increase in the labour market return to these skills. *Weinberger* (2014) reveals that the relationship between the non-cognitive skills and the expected incomes and the probability of permanent employment in the labour market of the United States in the case of those born in 1973–1974 is much stronger than in the case of those born in 1953–1954.

The most important reason for the growing demand for non-cognitive skills is related to the nature of technological development. Jobs requiring employees who are open to changes, emotionally stable and have flexible thinking are less exposed to the crowding-out effect of new technologies (*Bode et al,* 2016). Additionally, accelerating technological development, the proliferation of flexible work arrangements and the increasing embeddedness of firms in the global economy increasingly require open, flexible and innovative employees, who are able to communicate and cooperate with people from other cultures.

The second important factor is the accelerating urbanisation and the resulting increased demand in personal and cultural services. Personal relationships, emotional intelligence, imagination, empathy and openness have major importance in the jobs in this sector.

The third important factor is the aging of developed societies, which is accompanied by a growing demand for workers for healthcare and nursing tasks. This is also an area where, in addition to specific expertise, empathy, emotional adjustment, perseverance and social skills are also needed.

Opportunities for developing non-cognitive skills

The opinion that basic personality traits, as opposed to cognitive skills, do not change during our life is now considered outdated. Several longitudinal studies (*Cunnigham et al,* 2002; *Roberts et al,* 2015) confirmed empirically that different skills change significantly, albeit to a different extent, and are possible to develop in the various phases of life (*Heckman–Kautz,* 2013). Undoubtedly, the principal environment of developing non-cognitive skills in early childhood is parenting and early childhood education and care. Non-cognitive skills development programmes in early childhood and school age have a strong positive impact on the development of the cognitive skills of children. However, it is also true that if these early childhood programmes

are not followed up by well-targeted development in later stages, their effect diminishes over time (*OECD,* 2015).

Numerous research results confirm that non-cognitive skills may be successfully developed in primary, secondary and even in tertiary education and we have several non-cognitive skills which are also possible to develop in adult education. For example, research into the impacts of programmes developing non-cognitive skills at school indicated that well targeted and well implemented programmes often achieve more significant results than several cognitive skill development interventions (*Cunha et al,* 2006; *Losel–Beelmann,* 2003).

The lack of non-cognitive skills in disadvantaged families influences the development of cognitive skills. In an emotionally healthy, stress-free environment it is considerably easier to develop the cognitive skills of children. The intergenerational effects of the development of non-cognitive skills are especially important. For example, in families living in a disadvantaged and stressful environment, the non-cognitive skill development of children should be accompanied by the the non-cognitive skill development of parents in order to enable them to provide an appropriate family background for the development of the cognitive and non-cognitive skills of their children. Non-cognitive skill development at school should never be limited to individual development programmes. Programmes that also cover the non-cognitive skill development of families and local communities are the most successful.

Which are the non-cognitive skills whose development is particularly important in certain life stages and what are the methods suitable for effectively developing them? Relevant education science research and practical development programmes understandably focus on skills that support achievements at school (such as diligence, discipline, sense of duty, strength of character). There are several initiatives aiming at the development of non-cognitive skills of pupils through a school subject embedded in the curriculum. According to meta-analyses investigating the impacts of these programmes, the majority have a positive impact – albeit to a varying extent – on the later life events of pupils.

However, the most important tool of the childhood development of non-cognitive skills is the school environment itself and the educational activities of teachers. The expertise, motivation and moral commitment of teachers have a decisive role in the non-cognitive skill development of pupils. This impact is pointed out by *Heckman et al* in their study published in 2014, comparing the life events of pupils completing upper-secondary school with a General Education Development test (GED) and those who finally pass a GED but have dropped out of school prior to it. According to *Heckman et al* (2014), the findings that among pupils with the same GED-results, the labour market success of those actually attending the entire upper-secondary school con-

siderably exceeds that of pupils dropping out confirm the positive impact of school as the most appropriate institution for non-cognitive skill development.

Solely detecting the impact does not reveal anything about the mechanisms schools resort to when developing these skills. The development of non-cognitive skills definitely requires teachers to have expertise and motivation different from those needed for developing cognitive skills. The extent teachers are able to develop the imagination, cooperation skills, cultural tolerance, endurance and perseverance of pupils when teaching various school subjects is of utmost importance. The effectiveness of this complex pedagogical work also substantially influences the successful development of cognitive skills.

In addition to assessing the non-cognitive skills of pupils, several recent initiatives aimed at assessing and supporting the relevant activities of teachers and schools. The Every Student Succeeds Act of the United States, replacing the No Child Left Behind Act in 2015, enables the supplementation of the cognitive tests – which are part of the evaluation of schools' performance – with non-cognitive skills assessments. *The Brookings Soft Skills Report Card* was developed by the Brookings Institute with the aim of supporting teachers in the evaluation of non-cognitive skills, encouraging schools to develop these skills and support the work of teachers in this field (*Whitehurst,* 2016).

Having recognised the increasing importance of non-cognitive skills, the OECD published a report in 2013 concerning the social and emotional skills of 24 thousand students. PISA tests are planned to be supplemented by items suitable for assessing non-cognitive skills (*OECD,* 2015a, b). From 2018 onwards, the mathematical, literacy and science tests of PISA will be complemented by tests measuring global competences. Global competences are defined as skills enabling pupils to interpret global, intercultural phenomena, apply differing perspectives and cooperate creatively with people having grown up in different cultures. Tools assessing non-cognitive skills are certainly not value-free. On the contrary, they assume that families, schools, development institutions and teachers impart not only knowledge but also values. Respect for human dignity, tolerance and empathy form the basis of the harmonious functioning of society, innovation capacity and economic development in all societies.

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